National Semiconductor (UK) Limited
John Busch House
277 London Road
Isleworth TW7 5AX
Telephone: 01-568 8855
Cables: NASC Isleworth
Telex: 8955817/8 NAS UK

National
Advanced Systems

ADVANCE 86 SERIES

HELP GUIDE

Dear Sir,

This is the first draft of a Help Guide issued by NAS, Advance, Ferranti and WHS. You will regularly receive updates and newsletters for filling into this guide from all 4 companies.

Please read this carefully and note the section listing the correct company to contact for a particular problem.

Yours sincerely,

G.P. WYLIE
UK MICROSYSTEMS ENGINEERING MANAGER
NATIONAL ADVANCED SYSTEMS

Directors:
M. Yuen (U.S.A.), D.P. Beadle (U.S.A.), Dr. R.R. Heikes (U.S.A.),
A.W. Anderson, P.J. Brockett, J.F. Clements.

Registered Office:
John Busch House
277 London Road Isleworth TW7 5AX
Registered in England No: 957679

Advance 86

Fault Guide

Please check following before contacting NAS service.

Disk won't boot and/or DSK ERR message

a) Check switch 2 element 1 is off
b) Remove top case, check disk controller card is seated firmly and that edge connector is clean.
c) Check key is not stuck down on keyboard. Try new keyboard. Check for broken or missing pin in keyboard connector.
d) Check integrity of DOS disk. Try another disk!

RGB Image revesed i.e. black figures on white background.

a) Dip switch 1 in wrong position

No Keyboard Input

a) Pin pushed back in keyboard plug.

Spurious Characters appearing on Display Device

a) Noisy mains. Mains filter required. Advise customer accordingly.

ADVANCE 86

BRIEF HARDWARE OVERVIEW 10/9/84

CPU

The 86 series computer utilizes the Intel 8086 processor running at 4.77 MHz. The 8086 is a true 16 bit processor with a 16 bit wide data bus and 20 address lines. The data bus and address bus are multiplexed.

8087

The Advance has provision for an 8087 Floating Point Arithmetic chip which can be fitted by NAS for £250 + VAT. This chip can speed up complex mathematical functions, ie number crunching, by up to 15 times. It cannot be fitted by the end user and requires software to drive it. To arrange fitting of 8087 customer should contact NAS on 01-568-8855 Ext. 309 Tech Support.

RAM

At present the 86 series comes with 128K of memory which can be upgraded to 256K by plugging in 18 x 4164 ram chips into the 2 lines of sockets provided. The chips must be of the 200 nano second access time. To check the amount of RAM available run the DOS utility CHKDSK to obtain memory count.

If message PARE2 appears on screen check that RAM is correctly fitted, that all chips are the right way around and all pins are making contact. If still failing contact NAS on 01-568 8855 Ext. 305.

NOTE: 256K is the maximum RAM available, the existing systems in your stock require modifying before expansion boards can be fitted.

Please Note: Microsoft Basic can only handle 64K max of RAM, increasing the amount of RAM will not increase the amount of BYTES FREE to the Basic user.

There is 16K of Video Ram present on the system this is separate from mains memory.

ROM

The 64K of resident ROM contains the Advance Microsoft Basic, the Cassette Operating System, Power up diagnostics and the ROM BIOS.

The present ROM fitted to the system does not allow correct operation of colour TV sets, displays are lacking in quality and are unstable, also 80 Col graphics will not appear on either TV screens or Comp Video monitors. RGB is unaffected by this fault.

New Roms will shortly be available but these will not contain Cassette Basic.

DISPLAY

Important: Select the correct display mode with dip switch No. 1
The display provides 16 colours.

The text display is selectable between 80 x 25 or 40 x 25. There are 8 video pages with 40 x 25 text and 4 video pages with 80 x 25 text.

The graphics display is 640 x 200 bit mapped display with 2 colours or 320 x 200 bit mapped with 4 colours.

Interfaces

Cassette port: is for the use of any standard domestic cassette recorder also provision for motor on/ motor off.

Ensure dip switch 3 is in correct position for drive levels.

Centronics: Industry standard centronics parallel printer port with following pin outs:

Pin No.	Designation
1	Strobe (active Low)
2	Data Bit 0
3	Data Bit 1
4	Data Bit 2
5	Data Bit 3
6	Data Bit 4
7	Data Bit 5
8	Data Bit 6
9	Data Bit 7
10	Acknowledge (Active Low)
11	Busy (Active High)
12	Paper Out (Active High)
13	Printer Selected (Active High)
14	Printer CR after LF (Active Low)
15	Printer Error (Active Low)
16	Initialise Printer (Active Low)
17	Select In (Active Low)
18	0v
25	0v

Centronics port is normally selected by DOS as LPTI: and is the default listing device.

RS232 Serial Port

Standard RS232 printer or comms port. NOTE: This part must be activate and its protocol set by use of the DOS command MODE. COM. Page 5-66 of the User Manual refers.

Pin outs as follows:

Pin	Designation
2	EIA TX DATA
3	EIA RX DATA
4	EIA RTS
5	EIA CLEAR TO SEND
6	EIA DSR
7	SIG GND
8	EIA CARRIER DETECT
9	+XMITCL REL
11	-XM ITCL DATA
18	+RCV CL DATA
20	EIA DTR
22	EIA R1
25	-RCV CL RET

Other pin outs are included in Appendix A

APPENDIX

Contents:

- Power Up Diags
- Pin outs for all connectors
- Pin outs for IBM Compatible Slots
- Dip Switch Settings
- Benchmarks

SELF TEST

POWER UP DIAGNOSTICS

Errors signalled by loudspeaker.

Error	Loudspeaker Notes	
	Long	Short
Processor Failure	1	0
ROM Checksum Failure	1	2
RAM Checksum Failure (including Video Ram)	2	1
Interrupt Controller Failure	0	2
Time Failure	0	3
Video Logic Failure	2	2

Error Messages

KEY E	Keyboard error, keyboard reset did not complete
DEY STUCK	Key stuck down on keyboard. Keyboard interface circuitry is failing.
CAS E	Cassette interface circuitry is malfunctioning
DISK E	Disk Interface circuitry is malfunctioning
PAR E2	Parity error (RAM Failure)

CONNECTOR PIN ASSIGNMENTS

1.1 Connector J1

This is a 0.1 inch pitch male header used to connect to the keyboard.

Pin 1	Keyboard clock signal
Pin 2	Keyboard Data signal
Pin 3	Deyboard Reset (Not used)
Pin 4	0 Volts
Pin 5	+5 Volts

1.2 Connector J2

This is a 5 way 180 degree D.I.N. coknector used to connect to the audio cassette.

Pin 1	Motor control output 1. Used with Pin 3 to control the cassette motor on recorders with a remote control facility.
Pin 2	0 Volts
Pin 3	Motor control output 2
Pin 4	Data In. This pin should be connected to the audio output of the cassette recorder.
Pin 5	Data Out. This pin should be connected to the AUX or MIC input of the cassette recorder. (See also notes on Switch 3)

1.3 Connector J3

This is a 0.1 inch pitch male header used to connect an 8 Ohm loadspeaker.

Pin 1	Speaker Drive Signal

1.4 Connector J4

This is a 15 way D Type socket used to connect the games paddles.

Pins 1,8,9 & 15	+5 Volts
Pins 4,5 & 12	0 Volts
Pin 2	Pushbuttom Input 1. When this pin is connected to 0 Volts then bit 4 of the games paddle register will be zero.
Pin 7	Pushbutton Input 2. When this pin is connected to 0 Volts then bit 5 of the games paddle register will be zero.
Pin 10	Pushbutton Input 3. When this pin is connected to 0 Volts then bit 6 of the games paddle register will be zero.
Pin 14	Pushbutton Input 4. When this pin is connected to 0 Volts then bit 7 of the games paddle register will be zero.
Pin 3	Games Paddle "A", X axis input. (The other side of the games potentiometer should be connected to +5 Volts)
Pin 6	Games Paddle "A", Y axis input.
Pin 11	Games Paddle "B", X asis input.
Pin 13	Games Paddle "B", Y axis input.

1.5 Connector J5

This is a 25 way D Type connector used to connect a parallel printer.

Pins 2,3,4,5,6,7,8 & 9	Data lines.	(Data bit 0 is on pin 2) (Data bit 0 is on pin 9)
Pins 18 & 25	0 Volts.	
Pin 1	Strobe Signal	(Active low)
Pin 10	Acknowledge	(Active low)
Pin 11	Busy	(Active high)
Pin 12	Paper End	(Active high-no paper)
Pin 13	SCLT.	(Active high)
Pin 14	Auto FD.XT	(Active low)
Pin 15	Error	(Active low-if error seen)

1.6 Connector J6

This is a 9 Way D Type socket used to connect a R.B.G. monitor.

Pins 1 & 2	O Volts
Pin 3	Red
Pin 4	Green
Pin 5	Blue
Pin 6	Intensity
Pin 7	Comp. sync. contains vertical & horizontal sync information.
Pin 8	Horizontal sync
Pin 9	Vertical sync

All the above are T.T.L. compatible signals.

1.7 Connector J6

This is a Phono Type socket supplying a composite video monitor output.

1.8 Modulator U.H.F. or V.H.F. output

This is a phono style connector for use to connect a domestic T.V.

1.9 Connector P1 & P2 (ISSUE 2 BOARDS)

These are 6 way 0.156 inch male headers, P1 is near 1.C.5 & 6, P2 is near 1.C.2 & 3, used to connect power.

P1

Pins 1 to 5	+5 Volts
Pin 6	+12 Volts

P2

Pins 2 to 6	O Volts

1.10 Connector P2 (ISSUE 3 BOARDS)

This is a 6 way 0.156 inch male header used to connect power.

Pin 2 & 3	0 Volts
Pin 4 & 5	+5 Volts
Pin 6	+12 Volts

1.11 Connector P3

This is a 0.1 pitch male header used to connect a light pen.

Pin 1	LPen. Light Pen Signal Input
Pin 3	LPen Sw. Indicates if light pen is in contact with the screen.
Pin 4	0 Volts
Pin 5	+5 Volts
Pin 6	+12 Volts

Edge Connectors P1 & P2

P1

This is a 40 pin connector intended to connect pin for pin with edge connector P1 on the system board. (Pin 1 to Pin 1 - Pin 40 to Pin 40)

P2

This is a 34 pin connector intended to connect pin for pin with edge connector P2 on the system board.

RS232 Serial Port

This is a 25 Way D Type Connector.

Pin 2	ElA TX DATA

Pin 6	EIA DATA SET RDY
Pin 7	SIG GND
Pin 8	EIA CARRIER DET
Pin 9	+XM ITCL RET
Pin 11	-XM ITCL DATA
Pin 18	+ RCV CL DATA
PIN 20	EIA DTR
Pin 22	EIA RL
Pin 25	-RCV CL RET

Floppy Disk Controller Board Connections

Edge connector J1 connects pin for pin with edge connector J1 on Disk Drive "A". (Pin 1 to Pin 1, Pin 34 to Pin 34 inc)
Drive "A" connects to Drive "B" as follows

	DRIVE "A"		DRIVE "B"
J1	Pins 1-9	J1	Pins 1-9
J1	Pins 10-16	J1	Pins 16-10
J1	Pins 17-34	J1	Pins 17-34

Note. A termination resistor pack (150 ohms) is required to be fitted in Drive "B" only.

EXPANSION SLOTS (IBM PC TYPE)

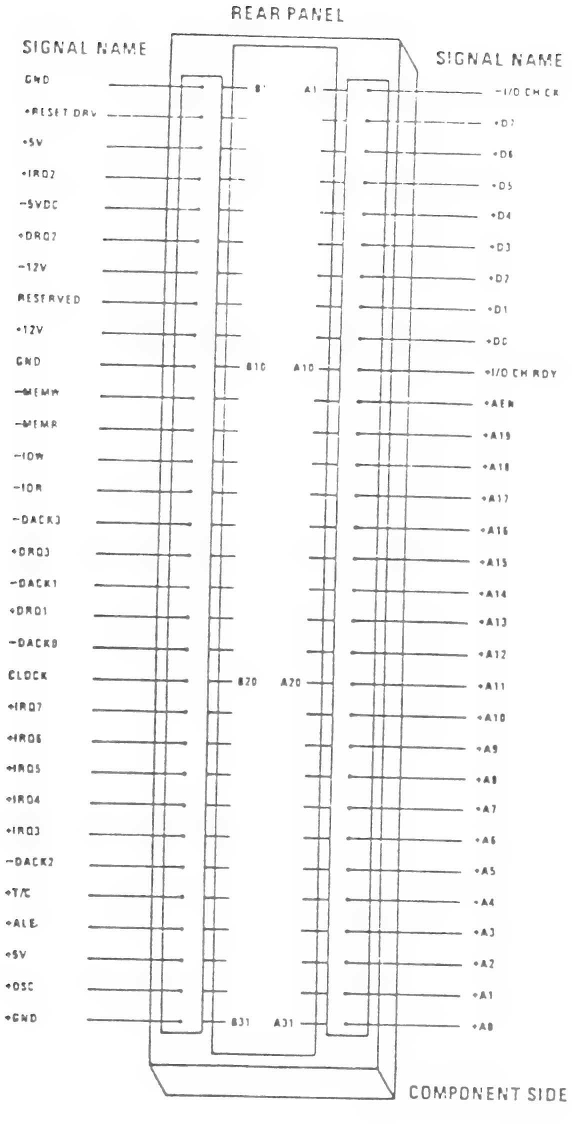
The expansion slots are extensions of the advance 86's Bus. When a card is plugged into an expansion slot the card becomes part of the 86 system. There are 4 expansion slots suitable for IBM PC type add on cards, one slot is taken up by the disk controller card.

The 62 pin DIP connectors (32 contacts by 2 rows) have a 2.54mm spacing between contacts and are printed circuit board mounting. The pin outs consist of:

1) 8 bit bidirectional data bus.
2) 20 bit addressing bus
3) 4 voltages +5V -5V +12V -12V
4) DMA addressing
5) 6 levels of interrupt
6) Device ready, memory refresh, clock etc.

The 16 bit data bus of the main system board is converted to 8 bit by ULA 021E ICL on the expansion board.

For pin outs see Fig. 2.4

REAR PANEL
SIGNAL NAME
GND
+RESET DRV
+5V
+IRQ2
-5VDC
+DRQ2
-12V
RESERVED
+12V
GND
-MEMW
-MEMR
-IOW
-IOR
-DACK3
+DRQ3
-DACK1
+DRQ1
-DACK0
CLOCK
+IRQ7
+IRQ6
+IRQ5
+IRQ4
+IRQ3
-DACK2
+T/C
+ALE
+5V
+OSC
+GND
B1
A1
B10
A10
B20
A20
B31
A31
SIGNAL NAME
-I/O CH CK
+D7
+D6
+D5
+D4
+D3
+D2
+D1
+D0
+I/O CH RDY
+AEN
+A19
+A18
+A17
+A16
+A15
+A14
+A13
+A12
+A11
+A10
+A9
+A8
+A7
+A6
+A5
+A4
+A3
+A2
+A1
+A0
COMPONENT SIDE

SWITCH SETTINGS

This section is very important and when selling the unit to the end user, it should be noted what type of Video device he is using and what output he will be using on the cassette device.

SWITCH 1

This switch is located between the Centronics port and the RGB port on the main logic board.

The switch is used to define the type of display device connected to the system board.

If an RGB monitor will be the main unit used the switch should be in the position nearest the card edge.

If composite video or a domestic TV is the main unit used it should be set in the position nearest to IC66.

If the switch is set for RGB monitor when using a domestic T.V. or video comp. monitor then unintensified characters will appear very faint on the screen.

SWITCH 2

This is the 4 position D.I.L. located near IC93.

Element 1: Indicates if an 86B expansion unit is fitted or not.
For unexpanded 86A unit it should be set to the ON position.
For expanded 86B unit it should be set to the OFF position.

Element 2: Set to the ON position with PAL domestic TV's and PAL standard composite video monitors.
Set to the OFF position for RGB monitors.

Element 3: Not Used set to OFF position
Element 4: Not Used set to OFF position

SWITCH 3

Is positioned near IC 109 behind the cassette socket J2. It determines the audio cassette drive levels. The switch position is set nearest to IC 109 for audio cassette AUX input or set nearest to J2 for audio cassette MIC input.

ADVANCE 86
BENCHMARKS

	Advance	BBC	ACT	ACT	IBM	SUPER	APPLE	CBM	SINCLAI
	86	B	APRICOT	SIRIUS 1	PC	BRAIN	II	64	SPECTRU
U	8086	6502	8086	8088	8088	280	6502	6510	28
1	0.8	1.0	1.6	1.7	1.5	1.6	1.3	1.4	4.8
.2	3.3	3.1	5.2	5.4	5.2	5.2	8.5	10.5	8.7
.3	7.3	8.2	10.6	11.1	12.1	14.0	16.0	19.2	21.1
.4	7.4	8.7	11.00	11.5	12.6	13.9	17.8	20.0	20.4
.5	8.1	9.1	12.4	13.6	13.6	14.8	19.1	21.00	24.00
.6	14.6	13.9	22.9	26.2	23.5	26.3	28.6	32.2	55.3
.7	23.9	21.4	35.4	40.1	37.4	43.2	44.8	51.6	80.7
.8	26.00	51.0	34.4	29.0	35.0	56.0	107.0	116.0	253.0
erage	11.4	14.6	16.7	17.3	17.6	21.9	30.4	34.0	58.5
ormance									
lative to vance.	100%	78.0%	68.3%	65.9%	64.8%	52.0%	37.5%	33.5%	19.5%

MS DOS

Quick reference guide for utilities.

CHKDSK allows you to check the amount of RAM fitted, the disk space allocation and disk and drive integrity.

DISKCOPY allows you to make co'ies of 9 sector IBM compatible diskettes. Please note Diskcopy supplied with Advance does not Format Disk and will not copy IBM 8 sector disks.

MODE allows you to turn on and configure the RS232 port. Allows you to set screen width and printer character width.

Ctrl P dumps screen contents

SYS	transfers system tracks to formatted disk
FORMAT	prepares raw disk for use
FORMAT/S	prepares disk and transfers system tracks
DISKCOMP	compares master disk and target disk following diskcopy
EDLIN	is a test text editor
DEBUG	is the direct debugging tool for writing assembly routines, altering and inspecting memory locations and inspecting and altering programs.